

REMARKS

In response to the Final Office Action dated May 11, 2005, Applicants respectfully request reconsideration. To further the prosecution of the present application, each of the rejections has been carefully considered and is addressed below. The claims as pending are believed to be in condition for allowance.

Overview of Embodiments of the Invention

One embodiment of the invention is directed to a method and apparatus for mirroring and restoring data (specification, page 1, line 5). The copying of data in real time from one storage area to another is referred to as mirroring data (page 2, lines 6-7). A mirror is created by synchronizing it to a source or standard storage area, so that updates to the standard storage area are also performed to the mirror (page 2, lines 21-24). A mirror that is synchronized to the standard storage area is said to be in a mirrored state, whereas a mirror that is no longer synchronized is said to be in a split state (page 2, lines 24-26). A mirrored storage area in a split state can be considered a snapshot of the standard storage area at a particular point in time (page 3, lines 1-5).

If a standard storage becomes corrupted, the data may be restored from a mirror in a split state (page 8, lines 4-6). In conventional systems, a restore operation that restores data to the standard storage area from the mirror typically involves not only copying information from the mirror to the standard storage area, but also a resynchronization so that any updates to the standard storage area are passed to the mirror (page 8, lines 6-9). However, Applicants appreciated that if a corrupting write were made, the corrupting write would be performed to the mirror as well as the standard storage area, so that the ability to recover uncorrupted data may be lost (page 8, lines 10-12).

In accordance with the one embodiment of the invention, while a restore operation is performed from a mirror to a standard storage area, updates to the standard storage area are not passed to the mirror, so that the integrity of the mirror is retained (page 8, lines 13-15).

The foregoing summary is provided merely to assist the Examiner in appreciating various aspects of applications for embodiments of the present invention. However, all of the discussion

above may not apply to each of the independent claims, and the language of the independent claims may differ in material respects from the discussion provided above. Thus, the Examiner is respectfully requested to give careful consideration to the language of each of the independent claims and to address each on its own merits, without relying on the summary provided above. In this respect, Applicants do not rely on the summary provided above to distinguish any of the claims of the present application over the prior art, but rather, rely only upon the arguments presented below relating to each specific independent claim.

Rejections under 35 U.S.C. §112

The Office Action rejected claims 1, 3, 14, 16, 23, 24, and 26 under 35 U.S.C. §112 as purportedly being indefinite. The Office Action asserted that the meaning of changing a state of the second storage area from a first state to a second state is unclear. This rejection is respectfully traversed.

Applicants note that each of the independent claims 1, 14, and 24 explicitly recites that a first state of the second storage area is a state wherein updates to the first storage area are made to the second storage area, and that the second state is a state wherein updates to the first storage area are not made to the second storage area. Thus, Applicants respectfully assert that the claims are clear regarding the nature of the first and second states of the second storage area.

In view of the foregoing, withdrawal of the rejection of claims 1, 3, 14, 16, 23, 24, and 26 under 35 U.S.C. §112 is respectfully requested.

Rejections Under 35 U.S.C. §102

The Office Action rejected claims 1-36 under 35 U.S.C. §102 as being anticipated by U.S. Patent No. 6,691,245 (“DeKoning”). This rejection is respectfully traversed.

DeKoning

DeKoning teaches a mirrored storage system that stores data for use by client devices (col. 5, lines 11-12), where the mirrored storage system includes a local storage device 108 and a remote storage device 110 (col. 5, lines 17-29). In the absence of a fail-over, the local storage device 108

serves as storage for the client devices, but in a fail-over situation, the remote storage device 110 takes over and serves as storage for the client devices (col. 5, lines 40-43).

DeKoning teaches a system for creating and synchronizing a remote storage device with a local storage device (col. 7, lines 57-66). However, DeKoning provides no teaching whatsoever relating to restoring data to the local storage device 108 from the remote storage device 110. Rather, on a fail-over, DeKoning teaches that the remote host 109 takes over and serves the storage requirements of the client devices (col. 5, lines 40-43).

Claims 1-13

Claim 1 is directed to a method for mirroring data of a first storage area. The method comprises placing a second storage area in a first state wherein updates to the first storage area are made to the second storage area, and mirroring data from the first storage area to the second storage area while the second storage area is in the first state. The method also comprises changing a state of the second storage area from the first state to a second state in which updates to the first storage area are not made to the second storage area, and restoring data to the first storage area from the second storage area while maintaining the second storage area in the second state.

The Office Action asserts that DeKoning teaches restoring data to a first storage area from a second storage area while maintaining the second storage area in a second state at col. 8, lines 24-44. Applicant respectfully disagrees.

The section at col. 8, lines 24-44 of DeKoning relates to a data synchronization procedure to update and synchronize a mirrored volume 132 on the remote storage device 110 with a volume 128 on the local storage device 108. The procedure includes transferring new data 152 to data block 162 of the mirrored volume 132, which duplicates data stored in data block 156 of the local storage device 108. Also, the preexisting data 170 that was present in the data block 162 of the mirrored volume 132 at the time of a last checkpoint is transferred to a snapshot repository 146. Using data in the snapshot repository 146, the data on the mirrored volume 132 can be restored to its state from the prior checkpoint.

The Office Action is not explicit about which volumes in DeKoning are believed to correspond to the first and second storage areas, but no reading of DeKoning discloses what is recited in claim 1.

The volume 128 of the local storage device 108 and the mirrored volume 132 do not correspond to the claimed first and second storage area, respectively, because DeKoning does not teach restoring data to the first storage area from the second storage areas. Rather, on a fail-over, DeKoning teaches that the remote host 109 takes over and serves the storage requirements of the client devices via access to the mirrored volume 132 (col. 5, lines 40-43).

Similarly, the mirrored volume 132 and the snapshot repository 146 do not correspond to the claimed first and second storage areas, respectively, because while DeKoning shows restoring the state of the mirrored volume 132 using the snapshot repository 146, DeKoning does not teach the limitation of claim 1 relating to mirroring data from the mirrored volume 132 to the snapshot repository 146 while the snapshot repository 146 is in a first state wherein updates to the mirrored volume 132 are made to the snapshot repository 146. DeKoning nowhere teaches that updates to the mirrored volume 132 are made to the snapshot repository 146. Rather, DeKoning teaches that updates to the mirrored volume 132 cause old data 170 (that was present in the mirrored volume 132 at the time of the last checkpoint) to be transferred to the snapshot repository 146 (col. 8, lines 18-38). Thus, the snapshot repository 146 is not placed in a state wherein updates to the mirrored volume 132 are made to it.

In view of the foregoing, DeKoning does not teach mirroring data from a first storage area to a second storage area while the second storage area is in a first state (in which updates to the first storage area are made to the second storage area), and restoring data to the first storage area from the second storage area while the second storage area is in a second state (in which updates to the first storage area are not made to the second storage area) as recited in claim 1. Therefore, claim 1 patentably distinguishes over DeKoning, such that the rejection of claim 1 under 35 U.S.C. §102 as being anticipated by DeKoning should be withdrawn.

Claims 2-13 depend from claim 1 and are patentable for at least the same reasons.

Claims 14-23

Claim 14 recites a storage system that comprises a first storage area, a second storage area and at least one controller. The controller (1) places the second storage area in a first state wherein updates to the first storage area are made to the second storage area, (2) mirrors data from the first storage area to the second storage area while the second storage area is in the first state, (3) changes a state of the second storage area from the first state to a second state in which updates to the first storage area are not made to the second storage area, and (4) restores data to the first storage area from the second storage area while maintaining the second storage area in the second state.

As should be appreciated from the foregoing, DeKoning does not teach at least one controller that places a second storage area in a first state wherein updates to the first storage area are made to the second storage area, and restores data to the first storage area from the second storage area while maintaining the second storage area in a second state wherein updates to the first storage area are not made to the second storage area. Therefore, it is respectfully asserted that claim 14 patentably distinguishes over DeKoning, such that the rejection of claim 14 under §102 as purportedly being anticipated by DeKoning should be withdrawn.

Claims 15-23 depend from claim 14 and are patentable for at least the same reasons.

Claims 24-36

Claim 24 is directed to a computer readable medium encoded with a computer program that, when executed, performs a method similar to that recited above in connection with claim 1. Therefore, for reasons similar to those presented above, it is respectfully asserted that claim 24 patentably distinguishes over DeKoning, such that the rejection of claim 24 under §102 as purportedly being anticipated by DeKoning should be withdrawn.

Claims 25-36 depend from claim 14 and are patentable for at least the same reasons.

CONCLUSION

A Notice of Allowance is respectfully requested. The Examiner is requested to call the undersigned at the telephone number listed below if this communication does not place the case in condition for allowance.

If this response is not considered timely filed and if a request for an extension of time is otherwise absent, Applicants hereby request any necessary extension of time. If there is a fee occasioned by this response, including an extension fee, that is not covered by an enclosed check, please charge any deficiency to Deposit Account No. 23/2825.

Respectfully submitted,

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